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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/005,006	01/09/1998	SHUICHI KANNO	ASA-695	1954
7590	06/15/2006		EXAMINER	
CROWELL & MORING LLP			NGUYEN, NGOC YEN M	
P.O. Box 14300			ART UNIT	PAPER NUMBER
Washington, DC 20044-4300			1754	

DATE MAILED: 06/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

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<b>Office Action Summary</b>	Application No.	Applicant(s)	
	09/005,006	KANNO ET AL.	
	Examiner	Art Unit	
	Ngoc-Yen M. Nguyen	1754	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) Responsive to communication(s) filed on 17 May 2006.
- 2a) This action is FINAL.                            2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) Claim(s) 40-46,48-51 and 79-86 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 40-46,48-51 and 79-86 is/are rejected.
- 7) Claim(s) \_\_\_\_\_ is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All    b) Some \* c) None of:
  1. Certified copies of the priority documents have been received.
  2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) <input type="checkbox"/> Notice of References Cited (PTO-892) 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.	4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____. 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) 6) <input type="checkbox"/> Other: _____.
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## DETAILED ACTION

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 17, 2006 has been entered.

In this office action, the species of C-F as the compound in the gas stream and aluminum oxide-nickel oxide catalyst are being examined. These species were elected without traverse in Paper No. 6 (filed July 26, 1999). Since there is no clear request from Applicants to shift to other species when filing the request for continued prosecution application, only the originally elected species are treated on the merit in this office action.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 40-46, 48-51, 79-86 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as

to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

There is no sufficient support for the limitation of “a decomposition of 80% to 100%” as required in the instant claims 40, 48, 80 and 81, 82 or “at 95% to 100%” as required in the instant claim 83. Applicants have pointed out that support for such limitation can be found in Figures 7 and 12, however, in Figure 7, only decomposition rate for  $C_2F_6$  is shown and the rate did not reach 100%. In Figure 12, the highest point shown for the decomposition rate for  $SF_6$  is 60%, only the decomposition rate of  $C_3F_8$  reached 100%. Support for some points for some species is not sufficient to give support for the entire claimed range for all the claimed species.

Also, there is no sufficient support for the limitation of “greater than 0.5% and up to 10% by volume” as now required in the instant claims. Applicants have pointed out that support can be found at various location in the instant specification which disclose “about 0.5%”, however, “about 0.5%” does not provide sufficient support for “greater than 0.5%” because “about 0.5%” would include values that are a little less than or equal 0.5%. There is no express teaching in the instant specification that the values of less than or equal 0.5% can be excluded.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 40-43, 45-46, 48-49, 51, 79-86 are rejected under 35 U.S.C. 103(a) as obvious over Rossin et al (6,069,291), optionally in view of Okazake et al (5,151,263) and Imamura (5,649,985).

Rossin '291 discloses a process for the decomposition of perfluoroalkanes to HF and CO<sub>2</sub> (note claim 1). The process comprises contacting the perfluoroalkanes with aluminum oxide. The perfluoroalkane is contacted with aluminum oxide at a temperature ranging from about 400°C to about 1000°C, or preferably from about 550°C to 800°C (note column 2, lines 55-65). This range is well within the claimed range. The decomposition temperature of C<sub>2</sub>F<sub>6</sub> is 750°C (note Example 1. This value is well within the claimed range.

Rossin '291 discloses that perfluoroalkanes are CF<sub>4</sub>, C<sub>2</sub>F<sub>6</sub>, etc. (Note column 1, lines 25-28). Rossin '291 discloses, in Example XIX, a concentration of 5,000 ppm (= 0.5%) tetrafluoromethane (CF<sub>4</sub>) in the gas to be treated. This value is well within the claimed range. For the other values of the claimed range, Rossin '291 does not disclose any limit for the concentration of the perfluoroalkanes in the gas to be treated. Thus, it would have been obvious to one of ordinary skill in the art to use the process of Rossin '291 to treat any exhaust gas, which contains perfluoroalkanes, especially when the gas was generated during electrolytic aluminum smelting, during tetrafluoroethylene manufacture, and during semiconductor manufacture (note column 3, lines 48-54).

The aluminum oxide is stabilized, for example, with an element selected from the group consisting of barium, calcium, nickel among others (note sentence bridging columns 2-3). The catalyst is formed by slurring pseudoboehmite aluminum oxide (which is encompassed by the claimed "boehmite") in an aqueous or non-aqueous liquid. Once mixed, one or more additional components may be added to the slurry. These additional components may be added as solid metal salts, such as nitrates,

acetates, oxalates, chlorides, halides, etc., or may be added as small metal or metal oxide particles. Once mixed, the slurry may be aged, if desired, or used directly in the manufacture of beads, particles, spheres, etc., or used to coat an inert ceramic substrate, such as a monolith. Following manufacture or coating of the inert ceramic substrate, the resulting material must be calcined at a temperature between 350 and 900°C (note column 4, lines 36-55). The calcination would convert the additional components into oxide forms if they are not already were.

Rossin '291 further discloses that the process is also applicable to the injection of gaseous or liquid phase perfluoroalkanes into a gas stream, including an oxidizing agent, such as air for example, and water (which would become steam at reaction temperature) (note column 5, lines 28-37 and column 3, lines 8-11).

In Rossin '291, since Ni is specifically disclosed as one of the additional components that can be added to the aluminum oxide catalyst, thus, the disclosure of Rossin is considered as having "sufficient specificity" to include alumina-nickel oxide catalyst.

In any event, it would have been obvious to one skilled in the art to select any combination among the specifically disclosed compounds, i.e. nickel-aluminum oxide, Merck & Co. Inc. v. Biocraft Laboratory Inc. 10 USPQ 1846.

Rossin further discloses that if the concentration of hydrofluoric acid in the effluent stream is deemed unacceptable, conventional collection or abatement process, such as caustic scrubbing, may be employed to avoid venting acid gases directly into the atmosphere (note column 5, lines 44-48). The processes steps as required in the instant claims for removing HF from the exhaust gases are conventional and well known steps in the art.

For claim 79, Rossin discloses that perfluoroalkanes are released to the environment during certain industrial processes, such as during semiconductor manufacturing processes (note column 1, lines 21-30). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to treat any perfluoroalkanes which were released from any semiconductor manufacturing process, including when such perfluoroalkanes were used as etchants or cleaners for semiconductor processes.

Optionally, Imamura '985 is applied to teach that HF is a water soluble component (note column 6, lines 48-49) and it can easily be removed by scrubbing with water (note claim 1).

Optionally, Okazaki '263 can also be applied to teach that acid compounds such as HCl, HF can be absorbed and neutralized by alkali (note column 4, lines 31-34).

Rossin discloses that the catalyst composition comprises aluminum oxide with the addition of between 0.01 and 50% of one or more elements selected from the group consisting of nickel among others (note paragraph bridging columns 3-4). The composition of the catalyst recited in Rossin '291 is stated in weight percent and were calculated based upon the elements described. When the metal component or components were added by wet impregnation techniques, the weight percent of the metal(s) within the impregnation solution and the amount of impregnation solution used to prepare the catalyst. When the metal component or components were added to the aluminum oxide precursor slurried in water, the weight percent of the metal component(s) were calculated from the amount of aluminum oxide precursor and the amount of metal(s) present within the slurry, the weight loss upon ignition of the

aluminum oxide precursor (note column 6, lines 1-15). Rossin does not specifically disclose the atomic ratio.

However, from the weight percent, one skilled in the art can calculate to figure out the atomic ratio. In Example IV, using 60g/mole as the molecular weight for the pseudoboemite "AlO(OH)", and 148.3 g/mole for the magnesium nitrate, the atomic ratio of Al:Mg is calculated to be out 49:1. In Example XIII, using 159 g/mole for the zirconium hydroxide and the atomic ratio of Al:Zr is calculated out to be about 2.65:1. These values are within the claimed range. Even though, Rossin '291 does not use nickel as the metal component in any of the Examples, however, one skilled in the art would have reasonably expected that the mole ratio of Al to Ni and any Zn would also be within the claimed range. Moreover, it would have been obvious to one of ordinary skill in the art to optimize the atomic ratio of aluminum to nickel based on the disclosed range stated above to obtain a catalyst best suited for transforming perfluoroalkanes.

In Example XIX, the conversion % at 750°C was 97.5% (note column 13), thus, Rossin '291 fairly teaches that the catalyst used can promote the decomposition of the fluorine compound at a decomposition rate of 97.4%. This value is well within the claimed ranges. It should be noted that there is no minimum time requirement for "maintained". The decomposition rate as disclosed in Rossin '291 is considered as being "maintained" at least along enough to achieve such rate.

Claims 44, 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rossin '291 as applied to claims 40-43, 45-49, 51, 79-86 above, and further in view of Rosenbaum (5,460,792).

The difference not yet discussed is Rossin '792 does not disclose the addition of zinc oxide.

Rosenbaum '792 discloses a process for the destruction of hydrocarbon compounds, which uses a catalyst comprising a carbonaceous pyrolyzed resinous polymer. The catalyst is doped with a compound selected from the group consisting of metal oxides, metal oxyhalides or precursor metal salts wherein the metal of the metal oxides, metal oxyhalides and precursor metal salts is selected from the group consisting of Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Co, Zn, Pd, Nb, Zr, Mo and mixtures thereof (note claim 1). Rosenbaum '792 further discloses that the process can be used for the destruction of organic compounds, which refer to either halogenated organic, or hydrocarbon compounds or mixture thereof (note column 4, lines 15-18). Exemplified compounds, which can be destroyed, are  $C_2Cl_4$ ,  $CCl_4$  (note column 6, lines 6 and 9), Rosenbaum '792 teaches that the halide can be any halide, while chlorine and bromine are being preferred (note column 7, lines 28-26).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to further include zinc in the catalyst of Rossin '792 because Rosenbaum '792 suggests that zinc, just as nickel, would promote the destruction of the halogenated hydrocarbon.

Applicant's arguments filed May 17, 2006 have been fully considered but they are not persuasive.

Applicants argue that in Figure 9, and page 39, lines 15-19 shows that for  $CF_4$ , the decomposition rate reached 100%. Furthermore, Examples 10-11 (it should be Examples 11-12, instead of 10-11 as stated by Applicants) showed decomposition rates of "99% or more". Applicants further argue that Figure 12, discloses decomposition rates beginning with just over 0% and continuing up to 100% for both  $C_4F_8$  and  $C_3F_8$ .

Even if adequate written description does not required that each and every species of a claimed genus be specifically described, however, in order to a create a range from the disclosed values, either in the specification or in the Figures, the end values for such range must be for the species and for the catalyst used, etc. In this case, the only support found for "80%" is for the decomposition of  $C_2F_6$  using alumina-titania catalyst (note Example 4, especially page 25, 9-11 and 14-16). The "100%" as pointed out by Applicants as having support from Figure 9 and Figure 12, such value is for decomposing  $CF_4$  or other C-F compound using alumina-nickel oxide catalyst, not alumina-titania catalyst. As for Examples 11 and 12, the "99% or more" is for decomposing  $SF_6$  and  $NF_3$ , respectively. Having one end value for one species and another end value for another species is not sufficient to create a range for the genus, especially when catalyst art is highly unpredictable and the decomposition rate is highly dependent on the process temperature.

Applicants argue that the catalyst used in the instant claimed process is specifically doped with nickel oxide in a particular ratio (7.2-49.4%) and the gas stream to be treated contains the CF compounds at higher concentrations (0.5% - 10% or 2 – 10%)

For the amount of nickel oxide in Rossin, Rossin discloses that the catalyst has 0.01 to 50% of one or more elements selected from the group consisting of nickel among others beside the aluminum oxide (note paragraph bridging columns 3-4), the composition of the catalyst recited in Rossin '291 is stated in weight percent and were calculated based upon the elements described. Thus, in the event that nickel oxide ( $NiO$ ) is the element used in the catalyst, the weight percent of the nickel oxide would at least overlaps the claimed range of 7.2 to 49.4%. For the concentration of the C-F compounds in the gas stream, in Rossin, a fluorine concentration of 5000 ppm (=0.5%)

is disclosed, moreover, Rossin '291 does not set any high limit for the fluorine concentration. It would have been obvious to one skilled in the art to use the process of Rossin '291 to decompose any gas stream containing perfluoroalkanes with any concentration of fluorine in the gas stream.

Applicants argue that catalyst chemistry is complex and unpredictable, and the mere mention of Ni as a possible catalyst component does not make it obvious to use in the same atomic ratio as the other components.

First, it would have been obvious to one of ordinary skill to select nickel as the other component for the aluminum oxide catalyst in Rossin '291, because nickel is specifically recited as a suitable component, Merck & Co. Inc. v. Biograph Laboratory Inc. 10 USPQ 2d 1846. Second, the other two examples were used to prove that an overlapping range for the weight % of the component, such as Mg, Ni, Zr, etc., would produce an overlapping range for the atomic ratio of the same

Applicants argue that the claimed invention achieves superior results not expected from the prior art.

Applicants argue that no Example is given for a catalyst composition containing nickel oxide for treating a gas containing 0.5 to 10% fluorine compounds and that achieves a conversion rate of 80-100%, for an extended period of time.

The disclosure of Rossin '291 should not be limited to just the examples. Rossin '291 clearly discloses that nickel is a suitable additional component for the alumina catalyst (note paragraph bridging columns 3-4). Rossin '291 fairly teaches that the concentration of the fluorine compound can be 5000 ppm (=0.5%) and the conversion rate is 97.4% (note Example XIX). It should be noted that Applicants' claims do not require any "extended period of time".

Applicants pointed out that Example 6 compares various catalysts containing alumina and another element. This side-by-side comparison of many catalysts showed that the two containing Ni were superior in achieving high reduction rate of CF compounds.

The above mentioned side-by-side comparison might show that the catalysts containing Ni were superior, however, this showing is limited to  $C_2F_6$  compound. As evidence of Rossin '291, the claimed C-F compound, in this case is  $CF_4$ , can be decomposed with 97.4% conversion rate without using a catalyst containing nickel. Thus, the showing in Figure 6 is not sufficient to show that there was an unexpected results when using nickel containing catalyst to decompose any C-F compound.

Applicants argue that in the declaration filed February 7, 2002, Mr. Kanno declared that “[o]ne skilled in the art would have expected a rapid deterioration of catalytic activity during treatment of a gas having a concentration of 5,000 ppm of a fluorine compound.”

This statement is not commensurate in scope with Applicants' claims. There is no time requirement for the claimed process.

Applicants argue that there is no need to recite the claims the time period of high reduction rate achieved by the claimed methods.

Some properties may not need to be include in the claims if they are inherently achieved, for example, by using deionized water, purer product can be obtained. However, in this case, if the treatment process were required to run for only a short duration, the alleged unexpected results of “extended use” would not be considered as “inherent”. Furthermore, in Rossin '291, all the conversion disclosed is higher than 90%, even if after the number hours disclosed, the conversion did drop off, there is still evidence to show that the drop off in Rossin '291 was significant so that the treatment

duration time for obtaining a conversion rate between 80%-100% is much shorter than that of the claimed invention.

Applicants argue that there is no need to recite in the claims the time period of high reduction rate achieved by the claimed methods. Applicants further argue that the claims recite the conditions under which the superior results are achieved, and under such conditions, the superior results are a necessary result of the claimed invention.

First, the time period of high reduction rate achieved by the claimed method is not inherent in the subject matter. The life of the catalyst used in the claimed process is inherent property for the catalyst, however, the duration of the process does not have to be the same as the life of the catalyst. The duration of the process can be much shorter such as when the process is complete before the end of the catalyst life. Secondly, if Applicants insisted that the duration of the process is inherent when performed the claimed process at the required condition, such duration would also be inherent in the process of Rossin '291 because the process of Rossin '291 has all the positive process conditions as required in the claimed process (note above rejection). In the event that the claimed process using a catalyst which was produced by a particular way in order to achieve a long life for the catalyst and "inherently" a long duration for the claimed process, such limitation must be included in the claims.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ngoc-Yen M. Nguyen whose telephone number is (571) 272-1356. The examiner is currently on Part time schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Stanley Silverman can be reached on (571) 272-1358. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 or (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed (571) 272-1700.

*Ngoc-Yen Nguyen*  
Ngoc-Yen M. Nguyen  
Primary Examiner  
Art Unit 1754

nmm  
June 12, 2006